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Building Tomorrow's Success

Guidelines for Thinking Beyond Today

the **Foresight Project**

MINISTRY OF
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An address by Professor James Belich provided material for the section "Where have we come from?"

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Foreword

We are on the brink of a period of profound change for our society. All that we do, all that we make, and all that we earn will be altered by new knowledge and technological change. Knowledge differs from other resources - each new discovery provides a platform for further discoveries. The Foresight Project is focused on exploiting knowledge for our future prosperity and well-being, and our development as a knowledge society.

Foresight is simply a way of thinking about the future. Rather than projecting into the future with assumptions about how today works, foresight involves constructing a vision of a desirable future, and then identifying strategies to take you there. The Foresight Project provides you with a framework for thinking about the sort of future you want, and thereby defining the context for the Government's research, science and technology investments.

The Government invests in research, science and technology to generate new knowledge, foster linkages and information flows, promote awareness and understanding, and build technological capability. In this way, the Government underpins innovation throughout all sectors of New Zealand, but it cannot work in isolation. Innovation must be focused on the needs of end-users - whose lives, environments and enterprises will be affected by new knowledge and technological change. Through the Foresight Project, the major innovation challenges for New Zealand will be identified.

The Government needs to be confident that its research, science and technology investments will be rapidly and effectively exploited to achieve these innovation goals. This is more likely where sectors demonstrate their strategic thinking about the future, through bold and dynamic innovation strategies. This booklet provides you with a kit-set - information and tools - for carrying out your own foresight exercises, leading to such strategies. I urge you to become involved, as your future is far too important to be left to chance.

Foresight is a style of thinking about the future that should be ongoing. While we are asking you to provide us with information about your innovation strategies later this year, you will no doubt want to refine your strategies and priorities as events around you change. The Government will also need to understand and respond to these changes, so that its investments remain relevant. Through the Foresight Project, the Government's investments will be managed in a more enabling, and less prescriptive, way. Your partnership with the Government can help shape the new investment approach.

M Williamson

Maurice Williamson
MINISTER OF RESEARCH, SCIENCE AND TECHNOLOGY
February 1998

Part 1 - Towards a Knowledge Society

THE FORESIGHT PROJECT FRAMEWORK

This booklet:

- explains the Foresight Project and how it relates to the concept of the knowledge society
- shows how it fits into the context of the Government's strategy for investment in research, science and technology
- explains how sectors - that is, groups sharing common interests and a concern for the future - can take part in Phase Two of the Foresight Project.

The goals

The Foresight Project has two broad goals:

- *Encourage an ongoing process of strategic thinking across diverse communities, as a basis for developing a coherent and forward-looking view of needs and opportunities for new knowledge and technological change.*
- *Using the insights gained, develop a new set of priorities for the Government's investment in research, science and technology, to take effect in July 2000, in order to complement the diverse strategic intents of other investors.*

The process

Foresight is a process for discovering a route to a desirable future. It involves imagining a desirable future, and elucidating strategies for creating that future. Foresight may be carried out by individuals, groups, enterprises or institutions.

Foresight is not centralised planning. Strategic planning can often be bound by thinking based on assumptions about how today works. Projecting assumptions formed in the past (e.g. about lifestyles, customers, markets) into the future can be dangerous. But in conventional strategic planning, it can also be hard to avoid.

The foresight process deliberately focuses on the long-term future. It establishes a coherent picture of trends, drivers and uncertainties, and helps to bring into focus a desirable position within that future. It also provides a conceptual framework for plotting paths to a desirable future, and identifying the "core competencies" critical for creating such paths.

Foresight should be an ongoing process, which generates, and keeps on generating, a sense of where to go and how to get there. The future cannot be expected to follow any charted pathway exactly. By developing a focus on foresight, it is possible to build an ability to adapt strategically to events and trends as they unfold, rather than simply managing the present.

Such an evolving view of the future provides a basis for regularly reviewing research, science and technology strategies. The Foresight Project employs the foresight process to build a picture of the research, science and technology strategies appropriate for taking New Zealanders forward into the future. The future cannot be centrally planned or determined. Instead it must be shaped by the aggregate thinking and action of people, groups and organisations across New Zealand.

The Foresight Project has been scheduled to enable revised priorities for publicly funded research, science and technology to be implemented from 1 July 2000. Inevitably, as views of the future evolve, so too should research, science and technology priorities. These priorities cannot be "future proofed".

The priorities defined in the course of the Foresight Project will therefore reflect the information and assessments available at the time decisions are being made. The priorities will need to be defined in a way that allows for reasonable adaptation to changing views of the future which result from ongoing foresight.

The project design

The Foresight Project links government investment in research, science and technology with New Zealand's development as a knowledge society. The path by which this will be achieved is an active process, which recognises the following four key imperatives:

- The focus on the future must not be constrained by what we have been doing in the past.
- Technology is a key driver for knowledge societies, and will have wide-ranging implications for the structure of society and the way we address economic, social and environmental goals.
- A globalised economy requires us to be internationally competitive.
- The Government's strategic investments in research, science and technology must be used effectively to underpin New Zealand's development as a knowledge society.

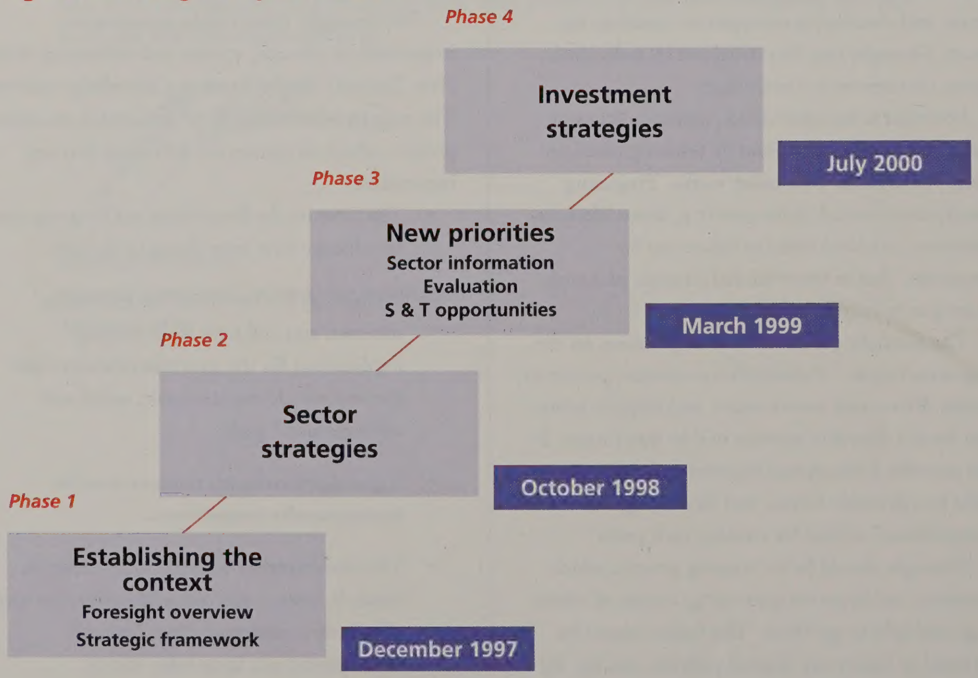
The Foresight Project aims to establish a shared sense of the future knowledge, skills, technologies and competencies that will be important for New Zealanders. This will depend on:

- Analysing the research, science and technology required to underpin and realise the strategic outcomes and competencies identified by various sectors.
- Identifying, from this analysis, a set of nationally relevant strategic outcomes and competencies to which public investment in research, science and technology will contribute.
- Developing a high-level statement of policies and priorities that sets out the way the Government will allocate its research, science and technology investments to achieve the strategic outcomes and build competencies, as well as strategies and guidelines for particular investments and agencies involved in managing them.

The Foresight Project differs from earlier priority setting exercises in three major ways:

1. Foresight is a style of thinking about the future that should be ongoing, and therefore should outlast the current formal review of the Government's priorities for research, science and technology.
2. Foresight is an evolutionary process, so that views of the future can be refined over time. As ideas evolve, through widespread input and interaction, strategic outcomes and competencies will undoubtedly be refined. Rather than prescriptive statements of rules and priorities, the aim is a robust policy and priorities framework within which the management of the investment by different agencies can develop flexibly over time.
3. Foresight is a process that encompasses much more than research, science and technology. Investments in research, science and technology will be most effective where they are applied within a context of broader thinking about possible futures, outcomes and competencies.

Figure 1 - Foresight Project Phases



Phase One: Establishing a context for thinking about future knowledge needs

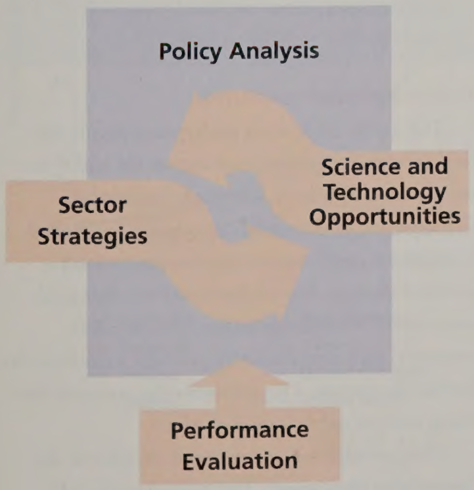
Following the initiation of the Foresight Project in mid-1997, this phase is now drawing to a close. Information was gathered on trends: economic, demographic, competitive, social, lifestyle, environmental, scientific and technological. Strategic thinkers in companies, public sector organisations and the community were interviewed about their insights on the future.

Phase Two: Sector strategies

Sectors (e.g. industry groups, environmental interest groups, or population-based sectors of society) are encouraged to think strategically about the future, and to come up with views about future research, technology and capability needs. Many sectors are well advanced already in developing relevant strategies. Other sectors will need guidance on how to use the foresight process.

Part 3 of this booklet shows how to get involved, and offers suggestions and starting points for sector strategy development. It also sets out a template for providing information for Phase Three of the Foresight Project. This information is required by 31 October 1998.

Figure 2 - Inputs to Foresight Project decision-making



Phase Three: Government decision-making about new priorities, drawing on many sources of information:

- *Policy analysis* - Basic principles underpinning effective public investment in research, science and technology will be reaffirmed or further developed, based on understanding the dynamics of creating value from knowledge.

- *Sector outcomes and competency requirements* - Sectors are encouraged to produce forward-looking strategies and to contribute information, using the processes and template set out in Part 3 of this booklet. Strategies should yield information about the future strategic importance of the sector, what outcomes the sector is seeking to achieve, specific competencies which must be developed to contribute to these outcomes, and the way the Government's research, science and technology investments are expected to contribute to achieving the outcomes and building competencies.

- *Performance evaluation* - During 1998, the effectiveness of the strategic research, science and technology supported by the government over the past five years is being evaluated. The results will feed into policy analysis, design and management of funding schemes, and thinking about future priorities.

- *Science and technology opportunities* - New knowledge and know-how, across scientific disciplines and technological frontiers, will open up opportunities for new ways of living, communicating, conducting business and managing the environment. Through consulting with a wide range of experts, in New Zealand and overseas, such knowledge will be drawn into the decision-making framework.

Phase Four: Implementing new priorities and investment processes

A major output of the Foresight Project will be a high-level statement of the Government's policies and priorities for public investment in research, science and technology from the year 2000/01 onwards.

New investment priorities will apply from 1 July 2000. Because purchase agents, providers and end-users will need to adapt their activities to align with a new set of priorities, the nature or operation of investment mechanisms will need to be signalled about April 1999.

The Foresight Project will also yield sector strategies developed around key areas, themes or issues. Strategies will set out the agreed roles of multiple investors, from both public and private sectors.

The wider contexts

The two broad goals of the Foresight Project mean there are two wide contexts within which it is being carried out. The first wide context concerns New Zealand's evolution as a knowledge society. The second is the policy environment within which the Government makes its investments in research, science and technology. Both of these contexts are described below, to provide a clearer view of the role of the Foresight Project.

KNOWLEDGE AND OUR FUTURE

New Zealand, like other Western industrialised nations, is evolving to become a knowledge society. In this type of society, individuals who are well-educated, self-motivated, and linked into information networks, are the most likely to live prosperous and fulfilling lives. Enterprises that are attuned to their customers' requirements, employ educated workers, encourage innovation through their workplace organisation, and know more and learn faster than their competitors, are the most likely to succeed and grow. At the national level, societies that maximise opportunities for individuals and enterprises to develop knowledge-age skills and access knowledge-age services, and that enable people to share a common sense of national identity and belonging, are the most likely to be cohesive.

This context for the Foresight Project requires that we recognise how the world's economy is changing rapidly, and what we can and must do if we are to adapt to these changes. We need to consider issues such as the role of knowledge in innovation, what drives successful innovation, and the critical leadership role which the government can play in this process.

Knowledge is one of the main drivers of prosperity and well-being. Knowledge includes information in any form, know-how and know-why. It involves the way we interact, as individuals and as a community. Knowledge can be embodied in people, as "human capital", and in technology.

Research, science and technology deal with creating, transferring and applying knowledge. The Foresight Project focuses on knowledge as the underpinning for innovation and growth in modern economies.

What's new about knowledge?

New knowledge and technological innovation have always influenced economic growth and well-being. They allow us to combine and transform raw materials so as to create new value, for example:

- adding value to fruit through skilful growing, packaging and marketing
- converting silicon into semiconductor chips
- creating vaccines from blood products.

The invested know-how, rather than the raw materials or the capital investment, accounts for a large share of the quality and value produced. What's new is that the knowledge component is becoming increasingly important and is now a critical factor in economic growth.

> *The contribution of knowledge activities, including education, communications media, information machines, and information services, to GNP has been increasing steadily over recent decades. Studies in the US indicate that this contribution increased from 29% of GNP in 1958 to 34% in 1980.*

The knowledge revolution

The world economy is undergoing significant change, with far greater emphasis on the ability to create, store, distribute, and apply knowledge. Globalisation of the world's economies has fuelled competition, and increasingly competitiveness is achieved through knowledge-based technological innovation. Knowledge differs from physical resources; each new discovery provides a platform for further discoveries. This generates the potential for rising rates of technological change.

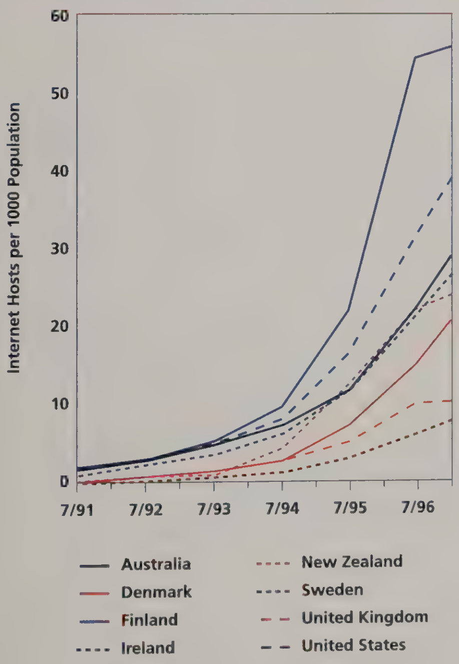
This principle has given rise to the idea of the "knowledge revolution". The increasing rate of knowledge-based innovation means that we are on the threshold of fundamental societal change.

Knowledge societies will exploit the enormous potential of new knowledge-intensive technologies in areas such as information and communications, biotechnology, medical systems, and nanotechnology. Over time, such technologies and the industries they support will become increasingly important, although other sectors of the economy such as manufacturing and agriculture will also benefit from the application of knowledge-intensive production and organisation.

What does this mean for New Zealand?

For New Zealand, the successful development of a knowledge society will involve moving towards systems, services and products with higher levels of value added by knowledge. This in turn will involve better and more rapid identification of the needs of stakeholders, customers, clients or beneficiaries, and better satisfaction of those needs through more intelligent production, distribution and service delivery.

Figure 3 - How connected is New Zealand?



The role of government

The increasing importance of knowledge in every economy and society is creating greater pressure on governments, in New Zealand and elsewhere, to be clear about their role. The shift towards knowledge-intensive products and services requires governments to move from simply providing support for underpinning knowledge creation to facilitating the capabilities, interactions and flows of information and technology that characterise a successful knowledge society.

Knowledge creation and diffusion, and technological learning, occur in different ways for different individuals, firms, organisations and sectors of the economy and society. The underlying beliefs and views about how they occur are often not explicit. But these beliefs and views strongly influence the role government adopts in the overall system.

In the past, governments typically saw their role primarily as funding underpinning research. The role of the private sector was funding development and marketing. Technology transfer required a separate set of programmes.

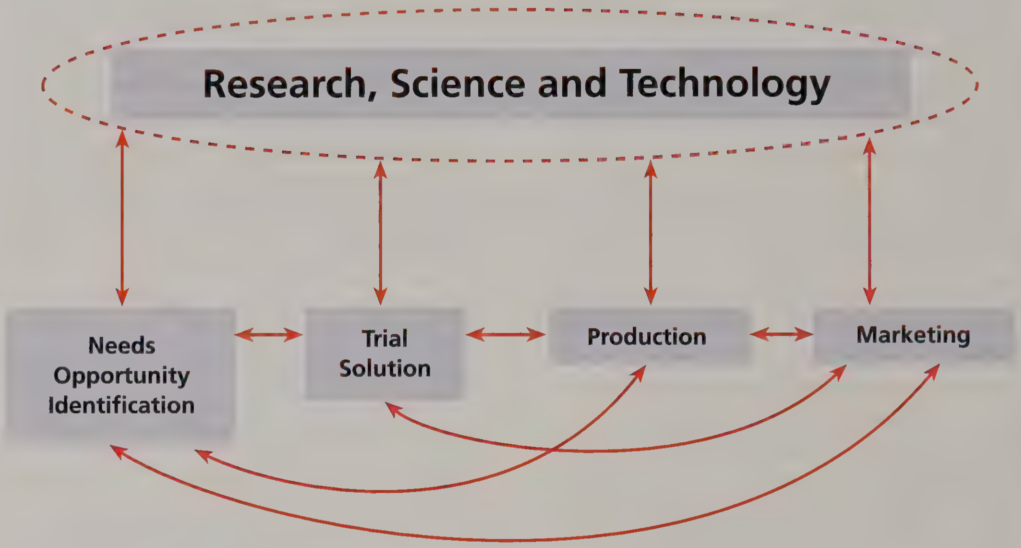
This division of roles stemmed from the assumption that basic research led to applied developments and on to marketable products in a linear way, with different agencies or firms having separate and distinct roles at different stages of the innovation process. The outcomes of policy based on this linear model of innovation tend to be that researchers regard industry and other "end-users" as short-sighted, whereas end-users regard publicly-funded research as irrelevant. A gap tends to emerge in the area of funding for applied research and development, severely constraining the practical outcomes achieved through research, science and technology.

Innovation - dynamic and interactive

For many years, it has been generally agreed that the innovation process is not linear. It is dynamic and interactive. This means that government policy-makers must pay attention to the interactions between different people, stages and processes within the innovation system.

The rationale for government support for research, science and technology is evolving beyond arguments about "market failure". Governments may also have a role in fostering networking among

Figure 4 - Interactive model of innovation


Research, Science and Technology
Needs Opportunity Identification
Trial Solution
Production
Marketing

the various actors and institutions in the innovation system. Across the world, governments are becoming increasingly concerned with encouraging research collaboration, increasing the mobility of scientists, encouraging the development of links among institutions, and diffusing research results. Link-building depends on all groups:

- sharing a common long-term view of the future
- being willing and able to communicate
- having comparable degrees of technical expertise.

The implications for research, science and technology in New Zealand

The policy framework for public investment in research, science and technology in New Zealand is aligning with contemporary understanding of the dynamics of knowledge societies, as outlined above. The policy framework in New Zealand forms the second wide context for the Foresight Project, and is set out below.

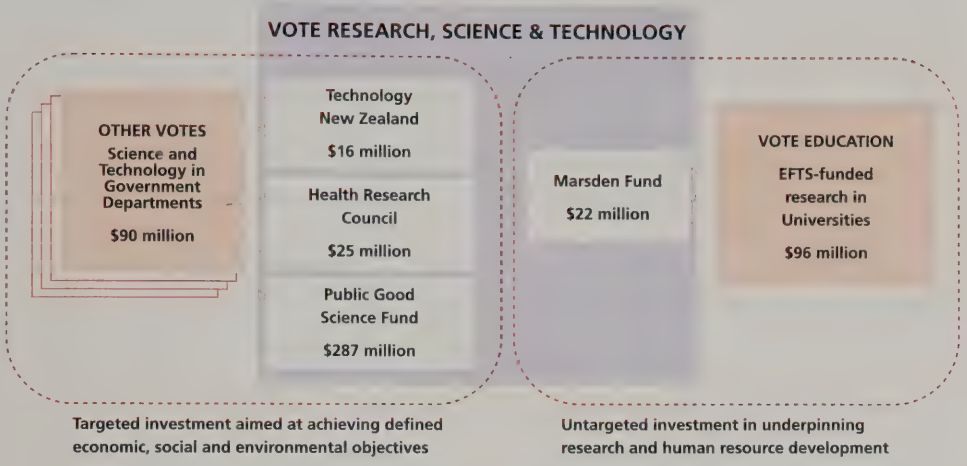
POLICY PRINCIPLES FOR RESEARCH, SCIENCE AND TECHNOLOGY IN NEW ZEALAND

The Government's strategy for research, science and technology

In 1996 the Government published *RS&T:2010 The Government's Strategy for Research, Science and Technology to the Year 2010.* This strategy included three overarching goals:

- *Fostering societal values and attitudes that recognise science and technology as critical to future prosperity.*
- *Ensuring an adequate level of investment in science and technology as a component in national life which has cultural value in its own right.*
- *Maximising the direct contribution of science and technology to diverse social, economic and environmental goals.*

Figure 5 - Major elements of the science envelope (1997/98)


VOTE RESEARCH, SCIENCE & TECHNOLOGY
OTHER VOTES
Science and Technology in Government Departments
$90 million
Technology New Zealand
$16 million
Health Research Council
$25 million
Public Good Science Fund
$287 million
Marsden Fund
$22 million
VOTE EDUCATION
EFTS-funded research in Universities
$96 million
Targeted investment aimed at achieving defined economic, social and environmental objectives
Untargeted investment in underpinning research and human resource development

The science envelope

The "science envelope" represents all the Government's research, science and technology investments - totalling approximately $590 million in 1997/98. Of this total, approximately 80% is targeted investment, aimed at achieving defined economic, social and environmental objectives. The remaining 20% is untargeted investment.

The balance set by the Government between untargeted and targeted investments will reflect, respectively, its commitments to a culture of knowledge and learning, and its contributions to economic, environmental and social outcomes.

Goals for targeted research, science and technology investments

The goals for targeted research, science and technology investments are:

- *Enhance New Zealand's capacity to innovate through knowledge creation and by developing capabilities and networks.*
- *Improve the international competitiveness of New Zealand's enterprises by increasing the contribution of knowledge to the added value of products, processes and services throughout the value-chain.*
- *Enhance and protect New Zealand's environment and natural resources by increasing knowledge of biophysical systems and hazards and human interactions with them, and by supporting the development of technologies for sustainable management of our environment.*
- *Contribute to well-being, equity and inclusiveness in New Zealand society by increasing knowledge of our own and others' cultures, societies, economies, histories and international contexts, and by supporting the uptake and use of such knowledge.*
- *Improve, maintain and restore New Zealanders' health and independence by increasing knowledge about individuals and populations, and the effectiveness and efficiency of health services.*

Setting priorities for targeted research, science and technology investments

The Foresight Project provides a framework for obtaining information useful to the Government when it considers new priorities for its research, science and technology investments. The nature, scope, intent and interactions of all investment instruments will need to be considered. Nevertheless, the Government's priorities may be articulated in a variety of ways.

While decisions on the detailed principles and criteria for articulating priorities have not yet been made, the following generalised principles can be foreshadowed.

Focusing on outcomes: Moving from rules to results

The Government makes targeted investments in research, science and technology to deliver social, environmental and economic outcomes for New Zealanders. This can occur in different ways, such as the development of new products and processes, or new ways of delivering services. There are many other contributing factors, and time-scales can be very long. However, research, science and technology which attracts targeted investment must be conducted purposefully, with outcomes as the driving motivation.

Outcomes for the Government's research, science and technology investments will be derived from the various sources of information obtained through the Foresight Project. In focusing on outcomes, the emphasis of policies and management practices will shift from rules to results, flexibility will increase, and the emphasis on tightly defined investment categories and pathways will diminish.

The Government will have the confidence to do this when it is clear that all those involved are actively engaged in strategic conversation about New Zealand's future. Performance measures will also be identified through the Foresight Project, in order to establish performance expectations for purchase agents and science and technology providers.

Supporting future-focused sectors

Research, science and technology will contribute most effectively to prosperity and well-being through genuine partnerships among researchers, scientists, technologists and other professionals underpinning a vibrant and thriving knowledge society. Such partnerships contribute to creating widely dispersed net benefits by:

- improving the strategic relevance of the Government's research, science and technology investments
- maximising adoption of results
- leveraging and stimulating investment by others in research and development, new capabilities, and technology development.

The Government needs to be confident that its investments will be rapidly and effectively exploited. Its investments will be increasingly focused on underpinning stakeholder groups which develop and articulate a vision for the future and develop forward-looking strategies for action. Such groups should demonstrate investment in research and development, new skills and capabilities, and effective means of accessing and learning from existing information. In environmental and social areas, the relationship between "public good" investment mechanisms and science and technology in government departments will need to be considered.

Purchasing balanced portfolios

The Government's investments will be managed in a way that maximises the adoption and application of science and technology, without diminishing incentives for or displacing investment by the private sector. The Government will purchase balanced portfolios of relevant activities from a range of "providers", through a range of funding mechanisms, to address long-term outcomes. For example, pursuing enhanced international competitiveness in a sector of the economy might involve creating new knowledge through the Public Good Science Fund (PGSF), improving firms' capabilities for technological innovation through Technology New Zealand, and investigating the impacts of specific Government policies through operational research in other departments. Together this would make up a portfolio of purchases.

Through the Foresight Project, the Government will develop strategies for addressing high-level goals, through different investment mechanisms. These strategies will be translated into requirements of the various "purchase agents", such as the Foundation for Research, Science and Technology and the Health Research Council.

The various investment instruments (such as the PGSF, Technology New Zealand, and the Health Research Council) represent administrative arrangements for purchasing relevant research, science and technology activities. Instruments should be differentiated simply in terms of the nature of the work purchased, rather than the intent of the work. The relative roles and sizes of major investment mechanisms will vary for different sectors.

The structure and application of these instruments will be reviewed, to enhance their contribution to agreed outcomes. Purchase agents will be accountable for contributing to outcomes by purchasing integrated portfolios of work. By shifting the emphasis from rules to results, "smart" purchase agents should use various ways of identifying and selecting portfolios, providers, and innovation strategies.

Fostering creativity and diversity

Pursuing tightly-defined outcomes does not mean purchasing tightly-restricted research, science and technology. Innovation thrives when diverse ideas, approaches, organisations and enterprises are encouraged to contribute to outcomes. Objectives for targeted research, science and technology will range widely in nature, scope and duration. Creative and diverse approaches to achieving outcomes will be encouraged.

"Smart" purchasing, relationship-contracting and contestability

Purchase agents will be accountable for contributions to outcomes through the investments they manage. "Smart" purchasing, across various investment instruments, must become a critical attribute of the way purchase agents contribute to outcomes. The focus of smart purchasing, and the relationship contracting it enables, will need to move from prescriptive allocations based on previously defined rules, to dynamic allocations based on evolving needs. Information and feedback will be vital for smart purchasing to operate dynamically and effectively.

Any individual, organisation or enterprise capable of supplying research, science and technology which the Government wishes to purchase will be given regular opportunities to make their case. But ensuring that funding is contestable does not mean that funding will be managed in a simplistically competitive way. A shared understanding of outcomes is necessary, so that relevant capabilities, effective networks and information flows can be developed and extended.

All of this depends on building long-term relationships between purchase agents (on behalf of the Government) and providers (carrying out research, science and technology). Both parties must build relationships and trust, based on deep knowledge of relevant sectors of the economy and society, so that the work done can contribute effectively to the outcomes sought.

The policy framework will continue to be developed in ways that ensure the incentives on purchase agents and providers lead them towards the kind of *relationship-contracting* behaviour described above.

Paying the full costs

Contributing to outcomes through the Government's investment in research, science and technology will inevitably involve integrating a wide range of activities collectively employing a wide range of assets. Such activities could include research, technology development and technology transfer, international links, promoting awareness and understanding of science and technology, building and sustaining capabilities and other assets, and disseminating results among stakeholder groups.

The full costs of all the integrated activities considered necessary for contributing to outcomes should be met from the Government's investment.

Part 2 - Thinking About New Zealand's Future

THE FORESIGHT TASK

In Part 3 of this booklet, sector groups are invited to consider a desirable future. Why should we do this, and is it possible to do anything sensible anyway? It has already been stated that foresight is not about predicting or planning the future. It is about taking all that we do know, and that we can observe from the past and the present, analysing some of the forces at work globally that will certainly affect us, and using our insights about the way groups and societies in New Zealand and around the world behave, in order to go forward with our heads up, our eyes open, and an intelligent adaptive strategy guiding our actions.

There are many ways to approach this task. Suggestions and a framework for getting started are provided in Part 3. Set out in Part 2 are some brief summaries of aspects of New Zealand past and present, and some indicators about drivers of future change. These trends and drivers have been woven together into three scenarios for New Zealand's future.

Where have we come from?

New Zealand since 1840

New Zealand's modern history can be divided into three periods.

"Progressive colonisation", extending from 1840 to about the 1880s, was characterised by energy, dynamism, ruthlessness and extremely rapid change in society, economics and culture. The Maori population fell, from about 60,000 in 1858 to about 48,000 in 1874. But in less than 50 years, the Pakeha population grew from 500 to 500,000, and changed from a few sealers, whalers and missionaries to a proto-people. In preparation for expected growth, railways were built for cities that did not yet exist, and houses for immigrants who were still to arrive. The ideological motif for this era was "greater Britain" - a vision of New Zealand equalling Britain in population, total wealth, and world status.

"Re-colonisation" lasted from the 1880s until about the 1960s. During this period, New Zealand developed very close relations with Britain, although clearly as a junior partner. There was rapid development of the "protein industry", providing town-supplies for Britain: in less than 60 years, it expanded to ship more than 500,000 tonnes of butter, cheese and meat there annually. The ideological motif for this era was "better Britain" - a vision of New Zealand as an exemplary paradise setting an example to the rest of the world. New Zealand became a tight, moralist, conformist society, but it was also secure and socially cohesive, providing good education and welfare.

This era collapsed between the 1960s and 1980s, as New Zealand moved into "de-colonisation" and globalisation, with huge diversification of export markets, much less dependence on Britain, and a far less conformist and less cohesive society.

All three periods demonstrate a capacity for enormous, rapid change. These historical "trajectories" can provide a basis for considering future pathways. For example, our modern history has been characterised by "cultural over-production". Ernest Rutherford and Katherine Mansfield were the flagships of a fleet of talented people - scientists, writers, artists, singers - who left New Zealand to work elsewhere, especially in Britain. Against expectations, New Zealand's predominantly agricultural economy over-produces such talent. Do we continue to discard it, or find ways of using it?

Where are we now?

Economy

New Zealand's annual gross domestic product, currently about $100 billion, is predicted to increase by 2-4% per year over the next 5-10 years. The nature of New Zealand's exported goods and services is changing. While the value of New Zealand exports doubled between 1986 and 1996 - from $13.9 billion to $26.4 billion - forestry, services and manufactured goods grew more rapidly than meat, dairy and horticulture.

The New Zealand economy has about 240,000 enterprises, with most employing fewer than 5 full-time equivalent staff. Unemployment is currently about 6.9%. Employment growth is highest in the services sector of the economy (retail, cafes and restaurants, accommodation, financial/business services, culture, recreation and personal services).

New Zealand's high current account deficit - 6.4% of GDP - is likely to lead to an increase in the real cost of capital, limiting investment, business growth, and international competitiveness. Business competitiveness nevertheless remains high within New Zealand, due largely to the high degree of deregulation.

Society

New Zealand's population is growing slowly, and ageing gradually. By 1996, equal proportions were aged under 15 and over 64, with 20% in each group.

While people of European ethnicity predominate, in 1996 Maori made up 14% of the population, Pacific Islands people 5%, and Asians 5%. Maori and Pacific Islands populations are growing at a faster rate than the population as a whole, due mainly to their more youthful structure. Average life expectancy (74 for males, 79 for females) is increasing, but remains below the OECD average. Life expectancies for Maori and Pacific Islands people are lower than for Pakeha.

The proportion of households consisting of two parents and their children has declined substantially over time for all ethnic groups except Asian/Other. In 1996, this type of family made up 62.8% of all parenting households. In 1996, 48% of Maori children, 45% of Pacific Island children, and 16% of Pakeha children lived in families where no parent had paid work.

Unemployment is much higher among Maori (16.8%) and Pacific Islands people (13.7%) than among Pakeha (4.5%). The rate among those aged 15-19 is 16.5%. In 1996, nearly 1 in 5 of those aged 15-64 had benefits as their main source of income.

Income distribution is widening. Only the top 10% of households have experienced a net gain in real disposable income over the last 15 years.

In 1996, 29% of non-Maori aged 18-24 were participating in tertiary education, as were 14% of Maori.

Environment

The New Zealand environment is experiencing many of the pressures affecting environments globally:

Land resources - Soil erosion is severe to extreme across nearly 10% of New Zealand. Soil compaction and contamination are common, although localised. At least 1.5m hectares of tussock grassland in the South Island have been degraded by grazing by sheep and rabbits and by invasive weeds.

Water resources - Intensive agriculture generates major pressures on water quality and quantity. Urban water resources are under pressure from increasing demand for water, sewage and stormwater discharges, and habitat modification. Tensions exist between resource management plans and Maori aspirations for water management.

Air resources - The quality of New Zealand's air and the effects of poor air quality are not well defined. Motor vehicles are the major source of air pollution.

Indigenous habitats and biodiversity - Human activity continues to modify habitats and threaten species and ecosystems. The conservation estate does not adequately represent the variety of habitats required by indigenous species. Pests threaten 1/3 of our forests. Biodiversity research is thinly spread and poorly co-ordinated, and impacts of pests, weeds and diseases are not well understood.

Biosecurity - With increasing openness of our borders, there is a rising risk of introduction of new exotic pests, weeds and diseases. The risks posed by pest, weed and disease control methods are also uncertain.

Sustainable fisheries - There is insufficient information on the biological status of many commercial fisheries, increasing the risk of over-fishing. Ballast water discharges may introduce ecologically or commercially significant pest species.

Energy services - New Zealand's long-term energy supply is not secure. Limits to our capacity for renewable hydro- and geothermal electricity generation need to be better defined. The principal gas reserve is expected to reach the end of its economic life in 2006. Incentives for energy efficiency are weak.

Transport - There is limited information on the true social, cultural and ecological costs of transport. Urban growth is putting pressure on the existing transport infrastructure.

Wastes and hazardous substances - Comprehensive data on wastes is lacking, and progress on waste reduction has been limited. There is still only limited understanding of the risks of hazardous substances and new organisms.

Climate change - While increases in the levels of future greenhouse gas emissions may be predictable, we are not immune to surprises, such as impacts of changes in market circumstances and trends for non-CO2 greenhouse gas emissions.

Capacity to innovate

New Zealand has fewer researchers, scientists and technologists in our workforce, per head of population, than most other OECD countries.

Engineers are a smaller proportion of university graduates in New Zealand than elsewhere in the OECD.

New Zealand's total investment in research and development is lower than OECD averages.

Figure 6 - Government and business R&D expenditure (1996)

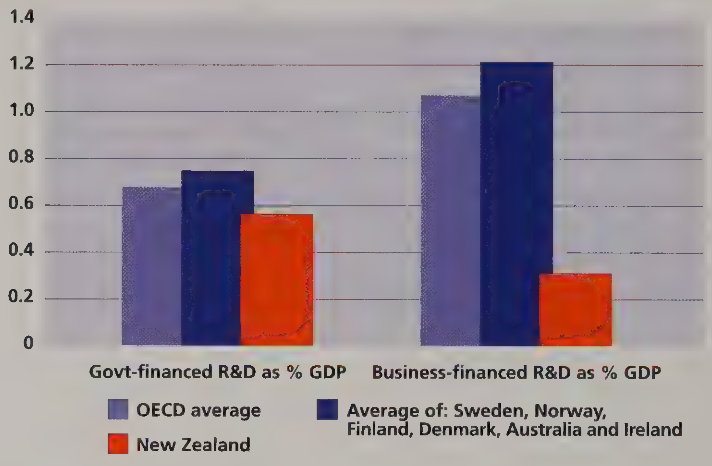


Figure 7 - Engineering graduates as % of total graduates (1996)

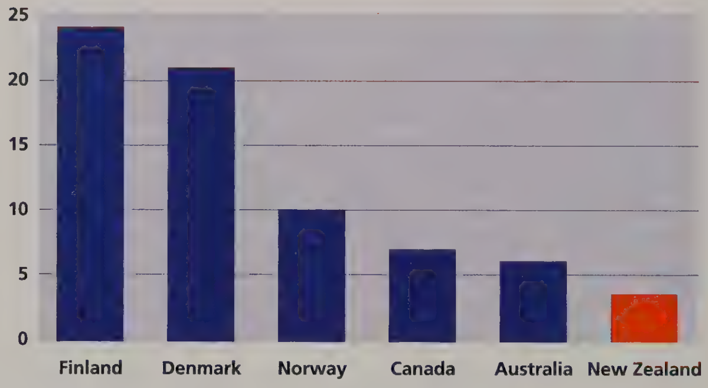
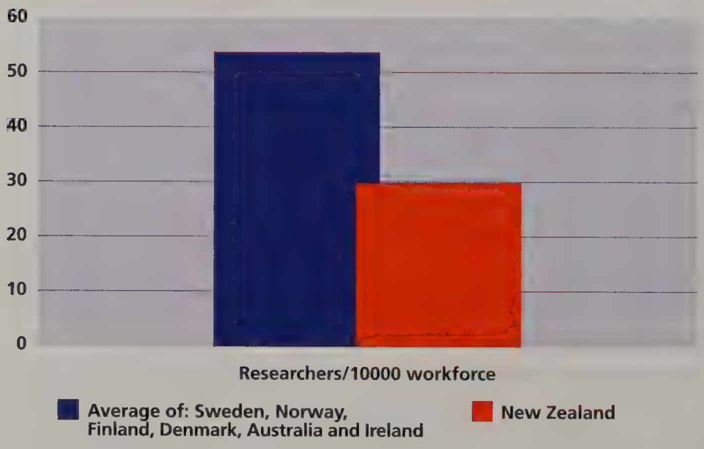


Figure 8 - Researchers in the workforce (1996)



Where are we going?

New technologies

The emerging international consensus on key technologies for the future is summarised in the chart below.

Technology Area	*Key Technologies*	*Examples*
Life sciences	Biotechnology	Protein engineering
	Food processing technologies	Controlled atmosphere storage
	Medical technologies	Cancer diagnosis/treatment
Information and communications	Software	Virtual reality software
	Communications networks	Data compression
	Components	High-density data storage
	Multimedia	Tele-medicine
Environment	Clean processing technology	Chemical synthesis
	Waste disposal and storage	Industrial waste disposal
	Remediation/recycling	Bioremediation
	Global environment	Modelling and monitoring techniques
Manufacturing	Automation/robotics	Advanced cutting
	Process engineering/control	Ultrapure refining
	Micro/nano fabrication	Microdevices
	Sensors	Electromagnetic sensors
Materials	Advanced ceramics	High-temperature ceramics
	Composite materials	Organic matrix composites
	Electronic materials	Superconductors
	Photonic materials	Optoelectronics
Energy	Energy efficiency	Fuel-efficient cars
	Energy generation	Superconductors
	Alternate energy sources	Hydrogen fuel cell

Globalisation

We are currently experiencing unprecedented global integration. National boundaries are becoming increasingly irrelevant to the flows of investment, skills, ideas, data, products and services around the world. The great enabler for globalisation is information technology, primarily through communication networks. But the motivator is the idea of the open society.

In increasingly competitive global markets, high added value will characterise successful economic activity. This, in turn, will require continuous improvements in productivity, innovation, flexibility and value.

Consumer markets

In the knowledge age, consumer markets are becoming increasingly differentiated, and commodity prices are declining. Manufacturing and distribution systems must adapt to these changing markets. The new focus on the consumer, combined with rapid technological change and shortening product life-cycles, is leading to more convergence between industries. For example, the core technologies of computing, communications and entertainment are extending into media, education, retailing, transport and banking. This convergence is forcing industries to redefine their markets and their core products and services.

Social organisation

In the short to medium term, relatively low rates of economic growth in industrialised countries will cause continued unemployment, along with more diversity and change in employment and all other forms of work. Employment growth in the next two decades is likely to be concentrated around "knowledge workers".

Family structures and patterns are continuing to change, with an increasing number of people living alone. Increasing equality for women is associated with declining birthrates and improving national welfare.

In many parts of the world, indigenous peoples are seeking to change disparities in education, employment, health and economic development. Rapid rates of technological, political and social change are compounding some of these disparities.

At the same time, crime and terrorism are increasingly proliferating, and becoming more destructive and difficult to prevent. In many nations poverty-traps tend to develop, perpetuating cycles of disadvantage from one generation to the next.

Environment

Growing human populations and economic development pressures are challenging the global environment, biodiversity and water resources. Global change, particularly climate change, could extensively damage biophysical, economic and social systems.

Globalisation may bring increased risks from diseases and pests, as people and goods move more freely between countries. Continuing increases in global energy demand could lead to tensions between energy consumption and a heightened greenhouse effect. Offsetting this are trends towards increasing environmental awareness, creating political and economic pressure for sustainable economic and social organisation.

SCENARIOS - DEVICES FOR THINKING ABOUT THE FUTURE

Scenarios are engaging, plausible stories about the future. They are not predictions or plans, but devices for mentally organising a large amount of information and thinking about various choices that lie in front of us. While the future is impossible to predict, it is not entirely uncertain.

Scenarios challenge us to think about the future as more than just an extension of the present. They challenge us to recognise better the key factors driving change - globally, nationally, and within our own sectors. In this way, we can consider critical options available to us, as we shape our own future. Within scenarios, the insights about the future can help us to identify what needs to be avoided as well as what is desirable. By constructing several scenarios, it is possible to explore how various futures might evolve - including "nightmares" as well as utopian visions. Usually a minimum of three scenarios, and rarely more than five scenarios, are used.

Three scenarios for New Zealand's future

We have developed three national scenarios which are consistent with the various ways in which underlying social, environmental and economic trends could unfold in New Zealand and globally. These scenarios, or stories, are summarised in Annex I. They are designed to do no more and no less than to stimulate you to think about the choices facing us as a nation. Scenarios are thinking devices, and in Part 3, sectors are encouraged to use them as part of a process for arriving at a vision of a desirable future and the outcomes and competencies required to reach it. The three scenarios are:

- *Possum in the glare*
- *Shark roaming alone*
- *Nga Kahikatea reaching new heights*

These scenarios depict different views of New Zealand in 2010. It is important to recognise that they represent three of many possible scenarios that may be constructed.

The three scenarios respond differently to the following "key drivers":

- *Fundamental technological change* - waves of new technologies will enable huge productivity gains and open up new opportunities to address economic, social and environmental challenges.

- *Globalisation* - the integration of the world's economies will mean a new ethos of openness, enabling free movement of people, ideas, goods and services.

- *Environmental quality* - There is growing concern about a range of environmental tensions, for example the reduction in biodiversity, climate change, our ability to manage waste, and sustainable resource use.

- *Social and demographic trends* - These include an ageing population, increasing urbanisation, changing family structures and work patterns, and an increasing recognition of the importance of social capital in creating wealth.

POSSUM IN THE GLARE

Scenario: New Zealand is caught like a possum in the glare of the oncoming future. But possums are hardy creatures, and New Zealand muddles along by finding new markets for traditional agricultural products, and combating falling prices with new production technologies. New Zealand has postponed thinking beyond the inevitable unsustainability of this situation. Skills and attitudes remain suited to the economy and society of the past 50 years. An entrenched underclass develops, and society is deeply divided. Auckland, to other New Zealanders, is like another planet. We become very vulnerable to risks of many kinds - economic, social and environmental.

SHARK ROAMING ALONE

Scenario: After a period of economic difficulty, New Zealand has adapted quickly to keep up with the changes of the early 21st century. Rapid uptake of new technology and the internet, and the success of the entrepreneurial approach, have made us a highly individualised society of sharks. New Zealand is diverse and entrepreneurial, but sharply divided and lacking in social cohesion, and although economically the nation's health is sound, socially it is in great danger.

NGA KAHIKITEA REACHING NEW HEIGHTS

Scenario: Around the world, there is much interest in the social change that has occurred in New Zealand over the first decade of the 21st century. What marks New Zealand out from other countries is a strong and widely shared sense of purpose and a national intent. A nation of Kahikitea, standing together.

Longer summaries of these scenarios are included as Annex I. Further information about these and other scenarios is available on the Foresight Project Website at http://www.morst.govt.nz/foresight/front.html

What can we learn from these scenarios?

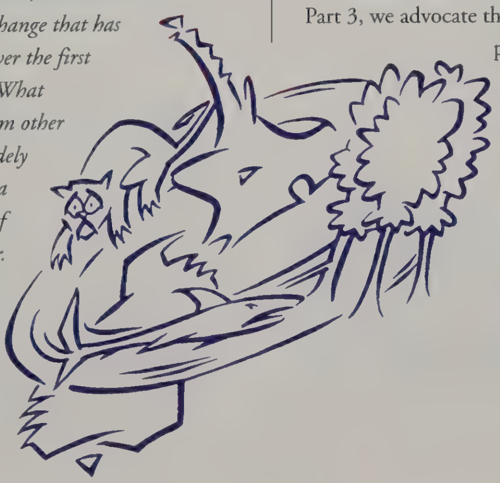
The three scenarios highlight some choices ahead, and challenge us to think about how we might deal with these choices. Some examples of such choices and decisions are:

- *Possum in the glare* - How will we fare if we simply wait for the future? Are the consequences suggested realistic? What could be done to avoid the undesirable consequences?

- *Shark roaming alone* - How important are agility and entrepreneurialism for success? Will agility and entrepreneurialism enable us to achieve prosperity and well-being as a knowledge society? How will such attributes influence social cohesion?

- *Nga Kahikatea: reaching new heights* - How important is social cohesion? Is working co-operatively vital for social cohesion? How does a commitment to a cohesive society influence economic and environmental outcomes?

Using scenarios to think about these and other questions, it is possible to develop a vision of a "desirable future", and an understanding of key decisions and strategies that will be necessary to move towards that future. Just as we have developed national scenarios, this process can be applied at other scales, for individuals, groups and sectors. In Part 3, we advocate the use of scenarios within a process for developing a view of a desirable future for your sector.



Part 3 - A Foresight Strategy For Your Sector

AN INVITATION TO BECOME INVOLVED IN THE FORESIGHT PROJECT

The Foresight Project has an overarching aim and a specific aim.

The overarching aim is to provide leadership for New Zealanders to develop a more comprehensive understanding of the future bases of our social, economic and environmental well-being.

The specific aim is to assist the Government in making decisions about priorities for future investment in research, science and technology.

If you are a member of a group of any size sharing common interests and a concern for the future (which we call a *sector* for convenience), then the Foresight Project provides your sector with the opportunity to engage in the foresight process. Information on how to do this is given below.

By doing so, you will encounter a wide range of diverse views about the future. You will be able to reach and engage with other groups, at workshops or using the Internet, whose future is interwoven with your own. The insights you gain will help you put together a foresight-based sector strategy that will contribute hugely to the quality of your sector's thinking, planning and acting.

Sectors may vary widely, in terms of size, position, and diversity of views. As the diversity of interests within any sector increases, the likelihood of a consensus view of a desirable future diminishes. There will be an increasing incentive to split into smaller sectors for the purposes of foresight.

Rather than attempt to guess in advance the nature and form of sectors, a key principle for the Foresight Project is that groups should "self-organise". The inevitable diversity of views that emerges from such a process will reflect diversity among New Zealanders generally.

If you are concerned about the kinds of investments the Government should be making for the future, in particular through research, science and technology, then we encourage you to contribute the insights which emerge from using the foresight process to the process of setting priorities for investments in research, science and technology.

Through the Foresight Project, the Ministry of Research, Science and Technology is conducting this priority-setting process. If your sector wishes to contribute insights and information, please use the template below (on pages 22-23) as a guide.

Contributions from sectors should be submitted by **31 October 1998**.

We recognise that there is likely to be considerable variation between sectors in the progress and scope of futures-based strategic thinking by the due date. Information will be used in a way that recognises this variation. Between now and then, our thinking and yours will be enhanced by talking and meeting with other sector groups, and collectively considering progress, through workshops, conferences, symposiums, focus groups and the Internet.

Please let us know about your involvement

Many sectors are already involved in foresight exercises. Others are just starting to recognise how thinking and strategising in this way could help them. Whatever stage your sector is at, please let us know now.

Contact the Foresight Project team at the Ministry of Research, Science and Technology:

e-mail: foresight@morst.govt.nz
phone: 04 472 6400
fax: 04 471 1284
post: PO Box 5336, Wellington

Information about how to contact us, and how to keep in touch with the Foresight Project as it progresses, is also on the inside back cover of this booklet.

We will be happy to establish your involvement in the Foresight Project, register you on our mailing list and on the Website, and provide suggestions for getting started if required. If you prefer, you can register your involvement directly at the Foresight Project Website:

http://www.morst.govt.nz/foresight/front.html

With your permission, we will post on our Website the name of your sector, contact person, and any other information you are happy to share about your foresight plans and process - for example, work in progress, any upcoming events such as open meetings or conferences, and links to your own Website if you have one. We will keep you regularly informed about the full range of sector strategy work through newsletters, the Website, and by convening workshops when appropriate.

Planning your involvement

There is a range of approaches for strategically thinking about the future. You will need to adopt an approach that suits your sector, the way you have organised, and your intended focus. The template that follows outlines key questions that you should address, regardless of the approach that you adopt.

There are, however, some key steps that will influence the success of any foresight. These include:

- Establish your focus - the nature and scope of your area of interest.
- Identify others that share your focus, and seek their involvement.
- Identify a leader, or a leadership team, for maintaining a foresight activity.
- Identify and assemble the necessary resources - people, communication facilities, analytical capabilities, time - to enable foresight.

Foresight resources

To facilitate the Foresight Project, the Ministry of Research, Science and Technology is making various resources available to participating sectors.

1. Visit the Website, at http://www.morst.govt.nz/foresight/front.html

   It contains information about the Foresight Project, background information about economic, environmental, health and social trends, examples of scenarios, a bibliography of useful reading, and links to other foresight-related sites.

   The Website will be used to inform Foresight Project participants about upcoming events, progress on sector strategies, and development in other policy areas related to the Government's priorities for research, science and technology.

2. A *Vision* newsletter will be circulated periodically with news about the Foresight Project.

3. Staff of the Ministry of Research, Science and Technology, and the Foundation for Research, Science and Technology are available to talk to groups about the Foresight Project. They can provide some limited assistance in getting sector strategies started or moving them forward at critical points.

4. Workshops, forums and symposiums will be held throughout the year, sponsored by the Ministry, the Foundation and other Foresight Project participants.

5. Consultants experienced in foresight work may be available on a commercial basis to advise sectors. A list of consultants is available on the Website.

HOW TO USE THE FORESIGHT PROCESS

The essence of a foresight-based approach to strategic thinking about the future is to begin not in the present, but in the future.

A step-by-step guide for building the information needed to carry out a foresight-based analysis for your sector follows. This is summed up in the flow-chart on page 24.

The foresight framework should be seen as an outline of main steps, rather than a recipe to be followed slavishly. Approaches will vary from sector to sector, and the approach taken by any sector may evolve over time.

The foresight sector strategy template

Imagine it is the year 2010. How do people live? Where do they live? What do they value? How are their needs met? How important is your sector to the economy, environment or society? How does it contribute to creating value? What has been achieved since 1998? What new skills and new knowledge did you need to acquire?

The template set out on pages 22 and 23 uses this kind of "foresight framework" to guide you through a strategic thinking process.

The template is based around four key questions. Answering these questions will require you to define a vision of a desirable future for your sector, what outcomes and competencies will be necessary to reach that vision, and what investments, by whom, will be required.

To contribute to the review of the Government's priorities for research, science and technology investment, send your analysis to the Ministry of Research, Science and Technology by **31 October 1998.**

FORESIGHT SECTOR STRATEGY TEMPLATE

1. What is the significance of your sector in 2010?

It is the year 2010. What is the strategic significance of your sector in New Zealand, and how does this differ from where you were in 1998?

What is your vision for your sector in 2010?	Describe what your sector is doing, what motivates the people involved, how you conduct business or deliver service, your key alliances and interdependencies. What are the important demographic, technological, political, environmental influences on your sector? If relevant, describe the capital and investment structure within your sector. How does all this differ from 1998?
What is your sector's contribution to broad economic, social and environmental goals?	Setting out key assumptions, describe how your sector will contribute to (from 1998 to 2010): • economic growth, employment, balance of trade • risk/hazard understanding or mitigation • maintenance and/or restoration of ecosystems • social cohesion • health and well-being of New Zealanders • New Zealand's capacity to be innovative.
Who and where are your stakeholders, and how do they differ from those of today?	Describe your stakeholders, in New Zealand and/or internationally. What kinds of lives do they lead? What do they need and value in 2010, compared to 1998? What are your core services and products in 2010, compared to 1998?
What makes you successful?	What other entities, nationally or internationally, are also interested in serving your stakeholders? What characterises your unique or competitive position?

2. What major outcomes contributed to making your 2010 position possible?

Think back to 1998. What were the important outcomes in and for your sector? What happened in what order? How significant was each outcome?

What key outcomes occurred to make your 2010 vison possible?	Describe actions by your sector, and interactions with other organisations or governments, resulting in significant changes or breakthroughs for your sector. Were new technologies or discoveries critical in achieving your vision? Were there any barriers to progress that had to be removed? Were all of the right people in the right places at the right times? Did they know enough about the right things?
Describe the relative contribution of each of these outcomes to the strategic significance of your sector in 2010.	Try to put the outcomes in priority order, and give a sense of their relative impact on your sector's contribution to the economy, environment and society in 2010. Do this quantitatively if possible.

3. What new or improved competencies enabled you, and those you interact with, to realise these outcomes?

Competencies combine knowledge, skills, technology and the means of acquiring them. In order to achieve the outcomes set out for Question 2, what competencies did you or others need to have that you did not have in 1998? How were these obtained?

What new knowledge was necessary?

What new skills were involved?

What new technology was required?

How did your sector get each of these?

What new relationships and linkages had to be developed?

What were the priorities between 1998 and 2010 - acquiring new knowledge through research, developing new technological skills, applying existing knowledge, improving organisational arrangements for sharing information, other things?

How does your sector acquire new knowledge and new technologies in 2010, compared with 1998?

The competencies needed in your sector in 2010 may differ from those you have now. Describe relevant competencies for your sector, and the ways they link together and change over time.

Example: A biosecurity competency could include biosystematics knowledge about organisms that we are seeking to exclude from New Zealand, systems for border detection of organisms, further systems for rapidly monitoring and describing dispersal of organisms if they get through our border controls, and eradication or control strategies for such organisms. Such a competency clearly involves many groups of people, sophisticated information systems, technical infrastructure, and considerable flexibility in the way these resources are organised.

4. Investment to achieve outcomes - who needs to do what?

Let's get back to 1998. Achieving outcomes for 2010 will require the investment of resources now, often by many players in both public and private sectors. In addition to financial resources, leadership and coordination will be required. What are your views on who should do what?

Who are the various existing and potential investors with interests in achieving the outcomes described in Question 2, and therefore in building the competencies set out in Question 3?

How are their respective investments organised? What are the performance expectations for the various parts of the total investment?

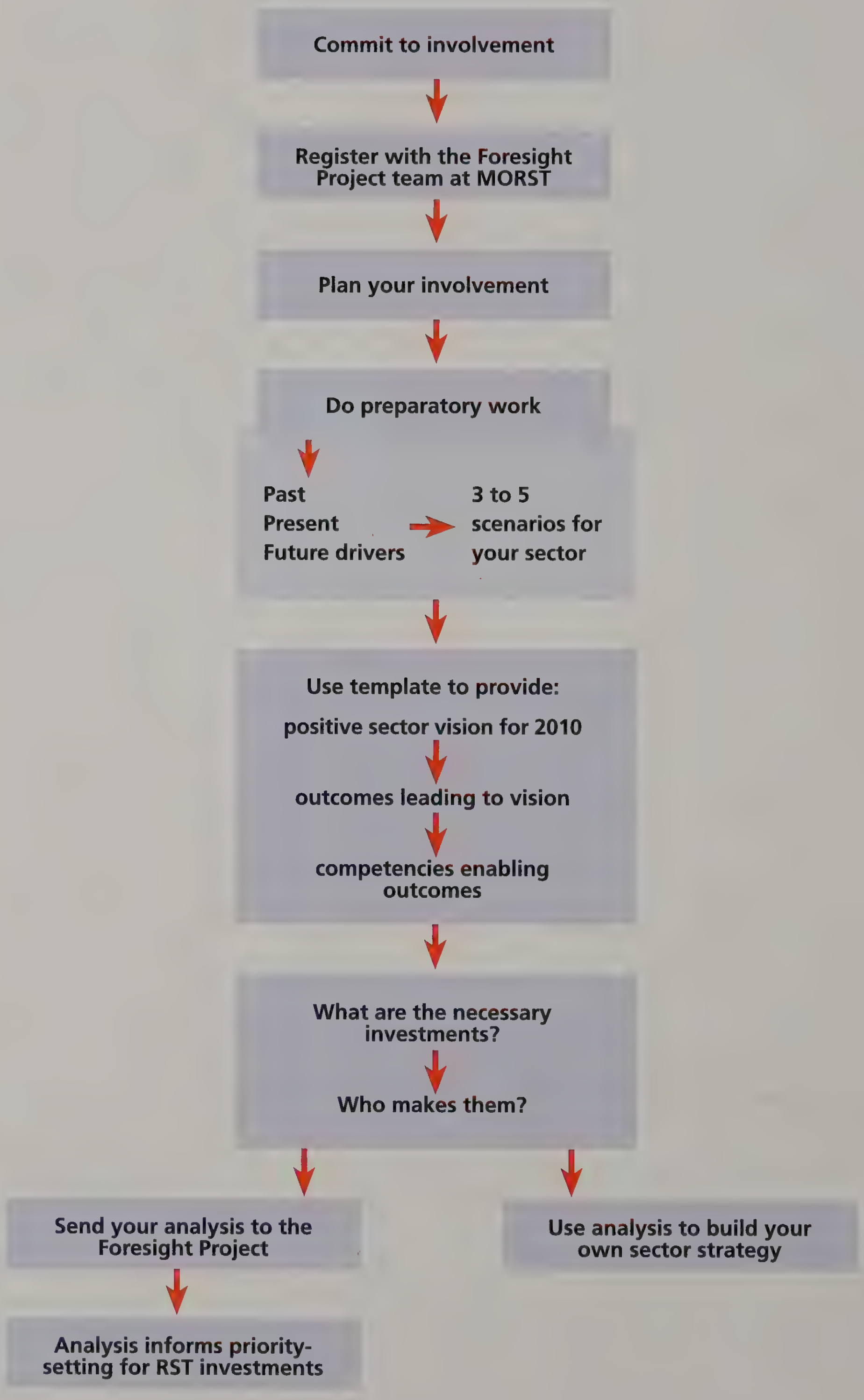
What is the expected or desirable relationship between the Government's underpinning investment and the investments of other stakeholders?

Describe your expectation of the Government's underpinning investment.

Identify and consult with different groups interested in achieving the outcomes set out for Question 2. These may well span private sector companies, central government departments, local authorities, iwi, Crown entities, health agencies and others. Who is investing in what? Is there a common framework for collectively building the competencies set out for Question 3?

A good sector strategy process should elucidate the different roles and priorities of the various investors. For the Government's investment, the respective roles of the various departments or agencies will need to be clarified.

Figure 9 - Using the Foresight process


Commit to involvement
Register with the Foresight Project team at MORST
Plan your involvement
Do preparatory work
Past
Present
Future drivers
3 to 5 scenarios for your sector
Use template to provide:
positive sector vision for 2010
outcomes leading to vision
competencies enabling outcomes
What are the necessary investments?
Who makes them?
Send your analysis to the Foresight Project
Analysis informs priority-setting for RST investments
Use analysis to build your own sector strategy

A. PREPARATORY WORK

1. *Thinking about the past*

Hindsight can be used to recognise past changes that have affected your sector, and to learn from these. Recognising that changes have already occurred is a first step towards throwing off current ways of thinking, and beginning to think about what the future might look like.

Recognising that past thinking may have created good or bad current positions also serves as a reminder that current thinking may not provide adequate bases for considering the future.

Look back, say to 1986, and identify the changes in your sector and origins of past thinking that may currently help or hinder progress towards the future.

2. *Thinking about the present*

An analysis of the position of your sector now helps to identify the issues that it faces. An understanding of current strengths, weaknesses, opportunities and threats can be used to test the adequacy of foresight-based strategies: will they build on strengths, eliminate weaknesses, lead you away from threats and towards opportunities?

List your sector's current strengths, weaknesses, opportunities and threats.

3. *Thinking about drivers of future change*

Drivers of future change for your sector include:

- trends that are already evident, sometimes called *the future that is already with us*
- faint signals and other harbingers of change
- possible events, sometimes called *wildcards*, that could totally alter the way your sector, and indeed the country as a whole, might operate.

These drivers might be derived from drivers operating at global or national levels, or they might be specific to your sector. Some of the global trends and changes shaping New Zealand's future were discussed in Parts 1 and 2. More information is available on the Website.

Note that trends peculiar to a sector may drive it in directions that would not be expected from an analysis of global and national trends alone. Trends and drivers can often be drawn together under a series of headings such as:

- demographic
- social
- technological
- environmental
- lifestyle.

A very large number of trends might affect your sector, but only a few will have really critical effects on it. As a further step towards futures-based thinking, you therefore need to identify the most important forces or events that will affect your sector. By identifying, sorting and ranking those events which are most likely to influence your sector, patterns emerge on which you can base your template.

4. *Constructing scenarios for your sector*

Developing scenarios involves using the knowledge you have now to look imaginatively, but plausibly, into the future.

Using the national scenarios we have developed (Annex 1), and the work you have done in the steps above - where you have come from in the past, what your current situation is, and what wider "key drivers" will affect you in the future - you can construct a series of scenarios for your sector.

By reading the scenarios for New Zealand, you will see how scenarios can be constructed. You can also consider whether any of the national choices outlined in those scenarios are relevant for further consideration within your sector. Constructing several scenarios - at least three, but not usually more than five - leads to insights about the future which can help to identify what needs to be avoided, as well as what is desirable.

B. USING THE TEMPLATE

1. *Significance of your sector - a vision for 2010*

Once you have constructed scenarios of possible futures for your sector, you can move on to identify a vision of a desirable future, from a 2010 perspective, using the template provided. This should be tested against your sense of success as a sector, in terms of factors such as profitability, improved health and well-being, or greater social cohesion.

The Foresight Project should lead us all to invest in a more positive future. It is important to recognise that the vision for any sector cannot exist in isolation. Stakeholders, including clients, customers, beneficiaries and competitors, will inevitably influence your sector and its vision for the future. So the vision should not only describe the desirable state for your sector in 2010. It should also characterise values, actions, relationships, and networks.

2. *Outcomes*

Outcomes result from policies, actions, discoveries and technologies that affect the ways people live, communities operate, services are delivered, and business is conducted. If your sector looks different in 2010 compared to 1998, then actions by individuals, groups, technical experts, governments or other entities must have resulted in outcomes that brought about change.

Using your vision of a desirable future, you can then identify important outcomes that will need to be achieved, to move your sector towards that future.

3. *Competencies*

The outcomes which contribute to reaching your vision will require various kinds of competencies. A competency is a combination of skills, knowledge and technologies, together with an organisational arrangement that enables people to acquire and use all three.

By analysing the outcomes identified in your responses to Question 3, you can in turn work out what competencies your sector will require to move towards your desirable future.

4. *Investment*

Various investors, including the Government, may share an interest in achieving the outcomes you have identified. Your strategy should consider how the interests of these various investors might interact, including the expected benefits each investor might be seeking.

The Government's research, science and technology investments should underpin innovation for forward-looking sectors. The analysis of the investment proposition should outline your expectations of the Government's investment, in terms of the high-level goals outlined in Part 1.

A FORESIGHT-BASED SECTOR STRATEGY

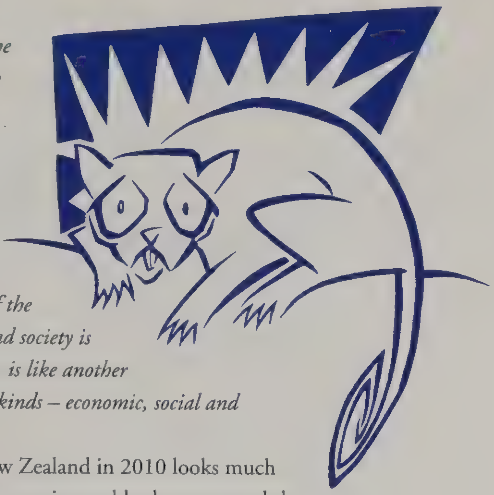
Once your sector has completed the sector strategy template, and has come up with the vision, the outcomes, and the competencies, what happens next?

As different sectors will have taken their foresight to different points by 31 October, the likelihood of further development of sector strategies will need to be recognised. The Government will consider the information you have provided, as it develops new priorities for its research, science and technology investment (as outlined in Part 1). The resulting investments will need to be managed in a way that recognises and responds to ongoing foresight, and the evolving innovation strategies within sectors.

Your sector should be able to translate the information and analysis into detailed innovation strategies. This will depend on interactions between your sector and others with related or overlapping interests. Networking between sectors is therefore likely to be important. Taking part in the Foresight Project should encourage such networking.

ANNEX I - Scenarios For New Zealand's Future

SCENARIO 1: POSSUM IN THE GLARE



Scenario: New Zealand is caught like a possum in the glare of the oncoming future. But possums are hardy creatures, and New Zealand muddles along by finding new markets for traditional agricultural products, and combatting falling prices with new production technologies. New Zealand has postponed thinking beyond the inevitable unsustainability of this situation. Skills and attitudes remain suited to the economy and society of the past 50 years. An entrenched underclass develops, and society is deeply divided. Auckland, to other New Zealanders, is like another planet. We become very vulnerable to risks of many kinds – economic, social and environmental.

From a plane flying over the South Island, New Zealand in 2010 looks much the same as it did in 1997. The amount of green space is roughly the same, and the population in this part of the country is only slightly lower than it was thirteen years ago. A closer look shows that the green spaces are occupied predominantly by corporate agriculture, focusing on large-scale dairying, meat production and forestry. Christchurch seems to have spawned a series of urban villages around its fringes, and the same phenomenon is visible north of Wellington.

As we fly further north, it is apparent even from the air that most of New Zealand's population growth over the past 12 years has spread itself around the Auckland/Mangere area. For New Zealanders who don't live in Auckland, arriving there is like arriving in another country. It is warmer, bigger, faster, more colourful and exciting, many languages can be heard everywhere, and over 50% of the population is of non-European origin. But large areas of the city are conflict-ridden ghettos, the tap water is not safe to drink, and the traffic is frequently grid-locked.

In 2010, while fewer New Zealanders are directly involved in agriculture than ever before, the New Zealand economy is still strongly reliant on agricultural production. Despite falling prices for meat, wool and most horticultural crops, and increased competition from developing countries such as South America, agriculture has remained viable largely through efficiency gains implemented as a result of research. Agriculture has become the province of large corporate owners, often not New Zealanders. The combined Ngai Tahu/Tainui company formed in 1999 is the biggest of the New Zealand-owned corporates.

Since the accidental importation of a South American grass-destroying weevil in 2002, which rendered 20% of all pasture useless for three years, there has been a high level of anxiety about the vulnerability of agricultural production to bio-hazards such as imported pests or deliberate contamination by a competitor. The genetic diversity of crops and animals is now very low, while crops and animals are engineered to withstand known pests and diseases, but the threat of an unknown pest doing significant damage remains.

During 1998 and 1999, as the Government moved to reduce intervention in various areas of the economy, Tradenz, Business Development Boards and the Technology New Zealand scheme were all disestablished. New Zealand companies find it increasingly difficult gaining a profile in some markets. Our more aggressive and unashamedly interventionist neighbour, the Republic of Australia, does not have the same difficulty, so many companies have adopted a "Made in New Zealand" logo featuring a small map of New Zealand superimposed on a large map of Australia, which has become well-known to the rest of the world. Many New Zealanders suspect this is part of a business and government agenda to make this country a state of Australia.

Growth in the manufacturing sector is only just beginning to take off, as the workforce has only slowly become more highly-skilled and a new technology-literate generation of managers and directors has only gradually built up critical mass. Manufacturing is still concentrated in low to medium tech areas. A relatively small number of firms have achieved significant global market share in niche export markets, almost always through the vision and skill of a single owner-operator. Most of the new entrants to the professional engineering and technology workforce are Asian, reflecting both an increase in immigrants from Asian countries and the success of New Zealand Asian students in maths and science.

The services sector makes up 70% of the economy in 2010, and contributes as much to foreign exchange earnings as agricultural production. Earnings from tourism have fallen, and the eco-tourist sector lost credibility when New Zealand's government failed to halt the wholesale destruction of 40% of the remaining native forests through logging and pest damage. During this period, from 1990 to 2010, over 30 more species of native birds, lizards and frogs became extinct, including the kakapo and the kiwi. Possums sitting on the road, staring into the glare of the oncoming headlights, are a common and increasingly symbolic sight.

New Zealand's workforce in 2010 has started to become more highly-skilled. A strong learning ethic modelled by Asian New Zealanders, the rising fear of unemployment, and the competition for affordable tertiary education, has meant that more children work harder - but equally there is a greater gap between those who succeed and those who fail.

New Zealanders in 2010 are deeply troubled. Divergence between rich and poor New Zealanders, and between the educated technology-literate and those without knowledge skills, has increased over the years, and an entrenched underclass has developed. The 2003 outbreaks of typhoid and cholera in South Auckland, leading to the deaths of over a hundred people, are still a bitter reminder to New Zealanders that this is not the egalitarian utopia our forebears set out to create.

Many of us in 2010 are uncomfortably aware that things cannot go on like this. It feels as though we are waiting for a crisis to force us to face up to the future. We probably won't have to wait long, as social tension is palpable, another killer disease arriving here would sweep through Auckland's ghettos, and our agricultural resources are equally vulnerable. We are not really in control of our own destiny in the fast-paced global knowledge age, and we feel helpless. As a nation, we spend more time looking back than looking forward into the glare.

SCENARIO 2: SHARK ROAMING ALONE

Scenario: After a period of economic difficulty, New Zealand has adapted quickly to keep up with the changes of the early 21st Century. Rapid uptake of new technology and the Internet, and the success of the entrepreneurial approach, have made us a highly individualised society of sharks. New Zealand is diverse and entrepreneurial, but sharply divided and lacking in social cohesion, and although economically the nation's health is sound, socially it is in great danger.

Looking at New Zealand's social and economic structures in 2010, it is hard to imagine the simplicity and uniformity of structures of 1997. Gone are the bureaucracies, and much of the plethora of conventions and laws that controlled our lives. Gone is the "cultural cringe" that limited the ability or willingness of New Zealanders to take on the world. Instead, an entrepreneurial spirit, coupled with agility, has seen New Zealanders find global leadership in a wide range of businesses. Diversity is celebrated locally, amidst decreasing scope of Government regulations.

The new entrepreneurial spirit has transformed the composition of the economy in New Zealand. However, these changes came only after a period of significant hardship early in the first decade of the 21st century for many of our traditional industries. Growing international availability of advanced production technologies eroded the ability of New Zealand's industries to command premium prices for differentiated products.

Knowledge-based businesses emerged as winners in the increasingly competitive global market place. The key factors for success were not systematically recognised at first, and it was a matter of survival of the smartest, with high casualties for companies unable to make the pace.

Small and agile firms led the way. These firms learnt to network with anybody, anywhere, anytime. The "tyranny of distance" was overcome, and these firms exploited the huge relative lift in their competitiveness. The underlying land resources, previously the key to competitiveness for our primary industries, instead became a platform on which to build technologies and brands, that were subsequently linked to lower-cost production systems elsewhere in the world. This led to some decentralisation of businesses and employment, finally arresting the demographic shift towards Auckland that characterised the 1980s and 1990s.

Production systems within New Zealand were also transformed, to provide more precise product specification and quality control, with biotechnology providing the basis for many of these new technologies.

Business investment in research and development increased dramatically, but much of this increased investment was focused on building in-house capability to meet firm-specific innovation needs. The Government continued to invest some funds in an underpinning knowledge base, and promoting linkages and information flows. Increased movement of researchers between private firms and the publicly owned research institutes further enhanced the value and relevance of the Government's investments.

The scope for tax collection by the Government was reduced, as electronic commerce displaced traditional retailing and more flexible employment structures displaced traditional PAYE systems. This reduction in revenue meant the Government was forced to reduce considerably the scope and value of welfare benefits. At the same time, however, increased resources were targeted at building technological capabilities in the early 2000s, increasing opportunities for participating in the new knowledge economy.

Over time, this decreasing ability of the Government to fund education to a satisfactory level, coupled with businesses' recognition of the crucial role of a well-educated workforce, led to much greater direct investment and influence by the private sector over education.

Social structures changed dramatically, as more and more people became connected to the global information infrastructure.

With easy access to world education and markets, individuals acted like holding companies, investing their time in diverse activities, managing their careers, granting access to others as nations used to grant visas. Working for more than one employer at a time, and often simultaneously for employers in different countries, became common.

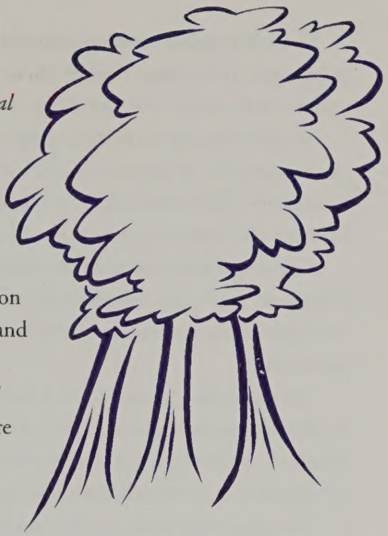
The new knowledge economy brought mixed blessings for the environment. On the one hand, some wastes and pollution were reduced, and decentralisation of business led to a reduction in traffic congestion and pressures on water and waste services in the major cities. On the other hand, collective action to address environmental problems was limited by the new individualism, and physical infrastructures began to decay with the dissipation of collective intent.

While the new wealth-creating businesses generally improved prosperity and well-being for New Zealanders, our identity was also redefined. More and more people internationally were looking for alternatives to city-bound lifestyles which seemed increasingly irrelevant in the interconnected world. New Zealand's small size, open spaces, and relatively clean air and water, were seen as desirable, and became associated with the identity of New Zealand's knowledge products and services.

New Zealand in 2010 is diverse, agile and entrepreneurial. But the weakening of national identity and collective spirit means that a new social underclass has emerged. The apparent lack of concern about, or the lack of social cohesion necessary to address, deeply entrenched social and environmental issues also preys on the minds of many.

The shark becomes increasingly restless. The freedom to roam, and the confidence to attack any new opportunity, has provided ongoing access to large and diverse sources of sustenance. But we are constantly moving to new feeding grounds, and suffer from a growing concern about the social and environmental problems we leave behind. Loneliness increasingly haunts the roaming shark.

SCENARIO 3: NGA KAHIKATEA REACHING NEW HEIGHTS



Scenario: Around the world, there is much interest in the social change that has occurred in New Zealand over the first decade of the 21st Century. What marks New Zealand out from other countries is a strong and widely shared sense of purpose – a national intent. A nation of kahikatea, standing together.

In 2010, levels of technological literacy and participation in the knowledge age, as well as levels of community care and safety, are as high in New Zealand as anywhere else in the world. New Zealand has become the "networked lifestyle" leader of the world – and people from around the world are competing for limited opportunities to be a part of this new society.

New Zealand is recognised as the global centre of innovation in socio-technical systems – a new way of integrating individual and social needs with technology and science. Individuals have shaped a new society by translating shared concerns into common goals, while elsewhere in the world, new technologies and globalisation have increased fragmentation of communities. This unusual blend of community and wealth reflects Maori heritage and values. Maori businesses, built originally on resource ownership but now strongly knowledge-based, display a management ethos that is community focused, a key point of divergence from global norms.

But it was not always like this in New Zealand. In the last few years of the 20th century, a disillusioned society was searching for a restatement of national identity and direction. The economy took some heavy blows in the late 1990s and the early part of the 21st century, as commodity prices continued to erode and production in Asia, South America and eastern Europe burgeoned.

The ultimate crisis came in 1999, when street rioting broke out in South Auckland, and spread quickly to the wealthy eastern suburbs and beyond Auckland to Northland, Hawkes Bay, Wellington and Canterbury. New Zealanders watched their self-image of tolerance and racial harmony literally go up in smoke and people began to debate what had gone wrong and what the future should hold. The debate focused on how New Zealanders could share in the opportunities of the knowledge revolution

Breakthrough change really kicked off in New Zealand on the back of some smart, bold initiatives within Maori communities. For a long time, people had been saying that the so-called Waitangi grievance industry was draining the country's emotional energy. At hui around the country to discuss the riots, it was unaminously agreed to petition for a three-year fast track solution to the hundreds of outstanding Waitangi claims. A new generation of Maori leaders emerged with tertiary qualifications and a hunger to catapult Maori into the knowledge age with the wealth from the settlement. Maori interests acquired leading-edge knowledge age companies, and also established a new technology university.

A theme uniting Pakeha and the increasingly entrepreneurial Maori was the challenge of "green enterprise". In the year 2000, 220 high-profile scientists in the CRIs, and the best research brains from around the world, were contracted by a private agency in a super-network of research brainpower. This talent was brought together as a virtual corporation – "Green Enterprise". Project teams focused on creating a major knowledge export industry.

Green Enterprise expanded into the sustainability and eco-efficiency issues for a wide range of companies. It became a world wide service provider to companies seeking to provide assurance to customers about the environmental sustainability throughout the life-cycle of their products.

To address a gap in spotting trends and creating the right products and services, a group of major exporters, spanning food, fibre and technical services sectors, formed "The Global Lifestyle Company". This virtual network organisation provided high quality intelligence on global lifestyles and customer segments to clients all over the world.

The consortium expanded into foresight studies, anticipating consumer preferences and behaviours 5-10 years into the future. The Global Lifestyles Company produced the information that enabled the transformation of New Zealand's resource-based forest, food, tourism and fibre industries.

"Co-opetition" became a key theme. Fierce competition between firms fuelled innovation locally, but strategic alliances worked to develop new brand and market niches. A key feature of these new markets was that revenue from licensing production rights globally, using technologies developed here, eventually exceeded that from product sales.

The new mood of social cohesion in business soon extended into other aspects of our life. In 2002, the Minister for the Future initiated a three-year trial of new interactive processes between the Government and the people, to build a greater partnership in decision making and find solutions to previously intractable social policy issues.

New Zealand's new identity, expressed proudly by people throughout the country, was technologically literate, networked, "co-opetitive" and eco-rich. This lifestyle renewal brought social cohesion to new heights, as we collectively celebrated New Zealand's renewed social leadership.

Contact Us and Get Involved

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